

Result of Neck Clipping and Coil Embolization as a Treatment for Unruptured Aneurysm

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Summary

The report of the International Subarachnoid Aneurysm Trial (ISAT) study showed that coil embolization was superior to neck clipping as a treatment for subarachnoid hemorrhage (SAH)¹. Recently, some results of treatments for unruptured aneurysm via coil embolization and neck clipping have been reported^{2,3}. We compared the results of coil embolization and neck clipping in our institute. Generally better outcomes were obtained by endovascular surgery than by neck clipping. Postoperative ischemic strokes occurred in one case (1.8%) as a major stroke and in three cases (5.6%) as a minor stroke among coil-treated cases, and in two cases (2.6%) as a major stroke, and in seven cases (9.0%) as a minor stroke among neck clipping cases.

Other complications after these treatments were six cases of subdural effusion/hematoma, four cases of infection, two cases of epidural hematoma, one abducens nerve palsy, one hydrocephalus, and one acute myocardial infarction among 78 neck clipping cases, and two subcutaneous hematoma, one pseudoaneurysm at the puncture points, one direct carotid-cavernous fistula among 54 coil-treated cases. Four coil-treated cases, in which introduction of microcatheters to the aneurysm was impossible, were treated completely by neck clipping after endovascular treatments. In terms of modified Rankin Scale (mRS) three months after treat-

ments, while mRS 3 was noted in only one case in the endovascular treatment group, there were one case of mRS 3, two cases of mRS 4, and two cases of mRS 5 in the neck clipping group. Duration of hospitalization averaged 11.9 days in the endovascular group and 24.1 days in the neck clipping group. The results of endosaccular embolizations as treatment of the unruptured aneurysm seems to be better than neck clipping. However, not all cases of unruptured aneurysms can be treated by coil embolization due to the width of aneurysmal neck and relation of the aneurysm to parent arteries. Therefore, surgeons should also be able to perform neck clipping as an alternative modality.

Introduction

The findings of ISAT were reported in 2003, and showed the advantage of endosaccular coil embolization over neck clipping for SAH because of the risk of ruptured aneurysm¹. Recently, some results of treatments for unruptured aneurysm via coil embolization and neck clipping have been reported^{2,3}. This study is compared the outcomes of those modalities at our institute.

Method

We performed endosaccular coil embolization for unruptured aneurysms in 54 patients

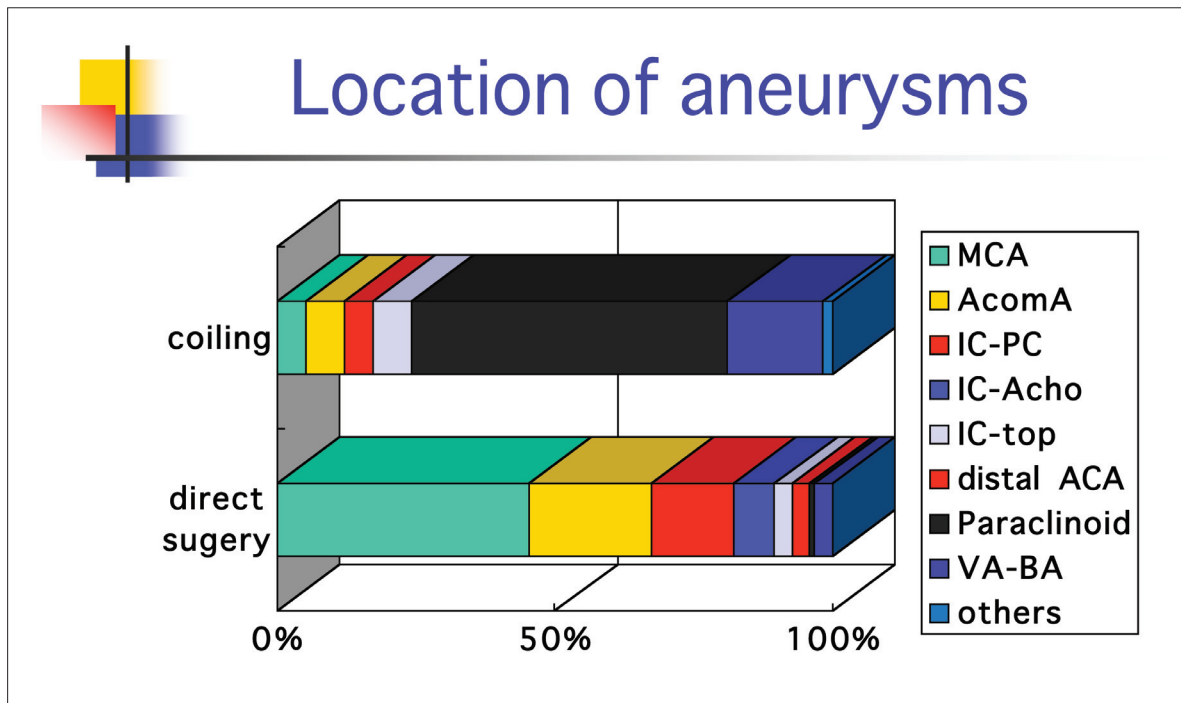


Figure 1 Locations of unruptured aneurysms treated by coil embolization or neck clipping.

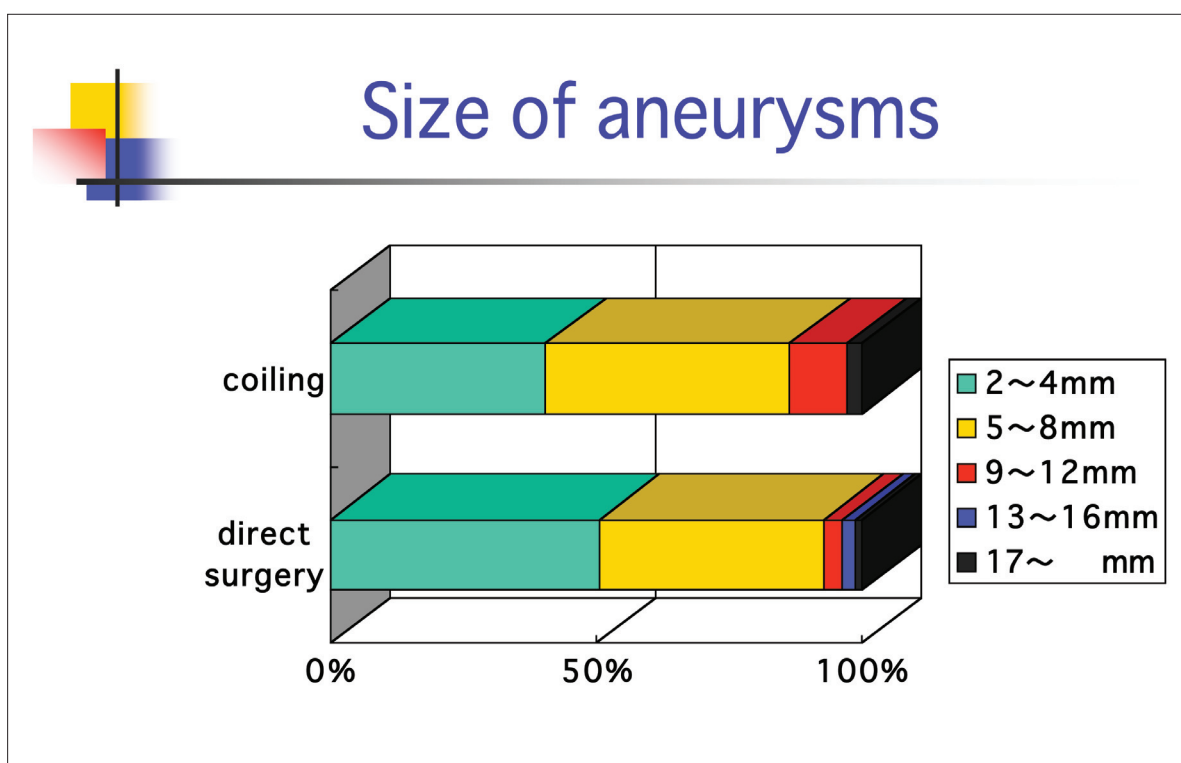


Figure 2 The sizes of unruptured aneurysms treated by coil embolization or neck clipping.

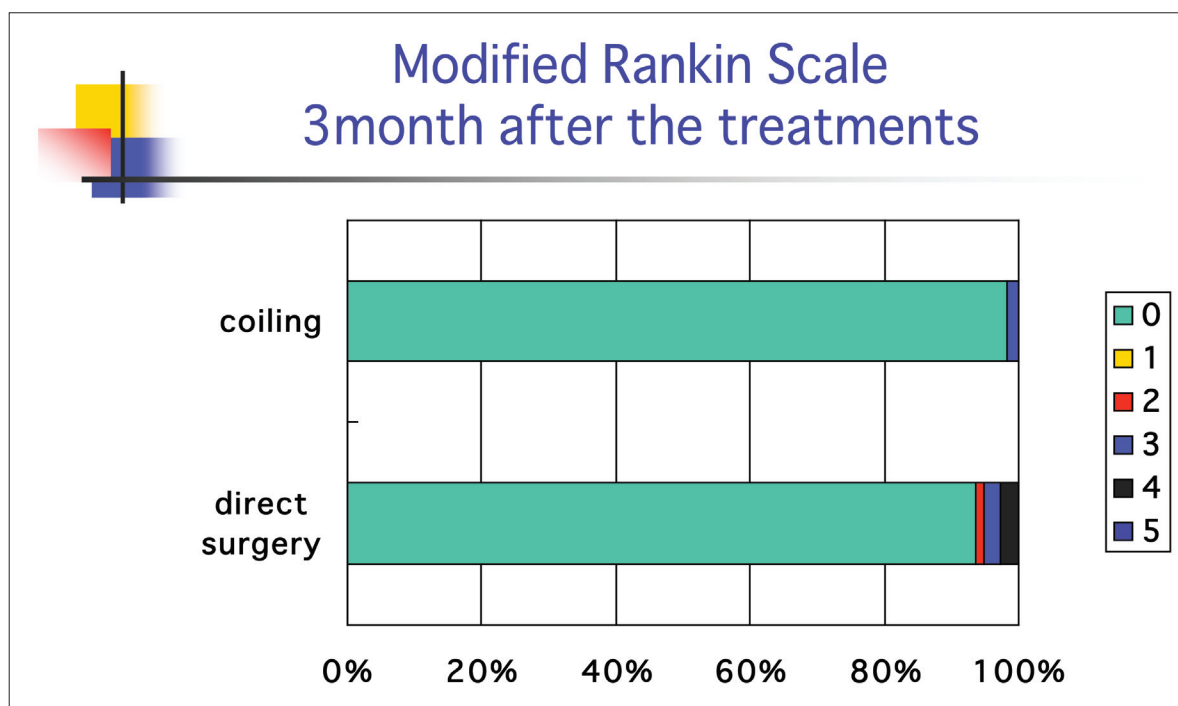


Figure 3 Modified Rankin Scale three months after the coil embolization or neck clipping.

(male seven, female 47, average 63.5 years), and performed neck clipping in 78 patients (male 23, female 54) between April 2000 and June 2005. We compared the locations, sizes, results of these two treatment groups.

Indication of the treatment for unruptured aneurysms is decided generally according to the guidelines of Japanese Society for Detection of Asymptomatic Brain Disease, namely, if the aneurysm is smaller than 3 mm in diameter we will perform observation, if the aneurysm is 3mm or more but smaller than 5 mm, we will select either treatment or observation depending on the specifics of each case, for example, we will consider factors such as patient age, risk of complications, location and/or shape of the aneurysm, existence of other aneurysms, and familial medical histories, and if the size is 5mm or more, we will recommend treatment. In selecting the treatment modality, we think the dome/neck ratio, whether there is intra-aneurysmal thrombosis, the access route in case of endovascular treatment, and consent of the patients or their families must be considered. More recently, we have basically selected endovascular treatment when we think either treatment would be possible.

Results

Regarding the locations of unruptured aneurysm, middle cerebral artery (MCA) and anterior communicating artery (A com A), internal carotid – posterior communicating artery (IC-PC) and internal carotid – anterior choroidal artery (IC-Acho) account for 89.5% of all neck clipping cases, while vertebrobasilar aneurysms and paraclinoid aneurysm comprise 74.1% of embolization cases (figure 1) because unruptured aneurysm in the posterior circulation and paraclinoid aneurysms, which is thought difficult to reach by direct surgery, are mainly treated via coil embolization. Figure 2 shows that the size of unruptured aneurysm treated by neck clipping was slightly smaller than that in the endovascular treatment group but this difference was not significant. Postoperative ischemic strokes occurred in one case (1.8%) as a major stroke and in three cases (5.6%) as a minor stroke among coil-treated cases, and in two cases (2.6%) as a major stroke, and in seven cases (9.0%) as a minor stroke among neck clipping cases. Other complications after these treatments were six cases of subdural effusion/hematoma, four cases of in-

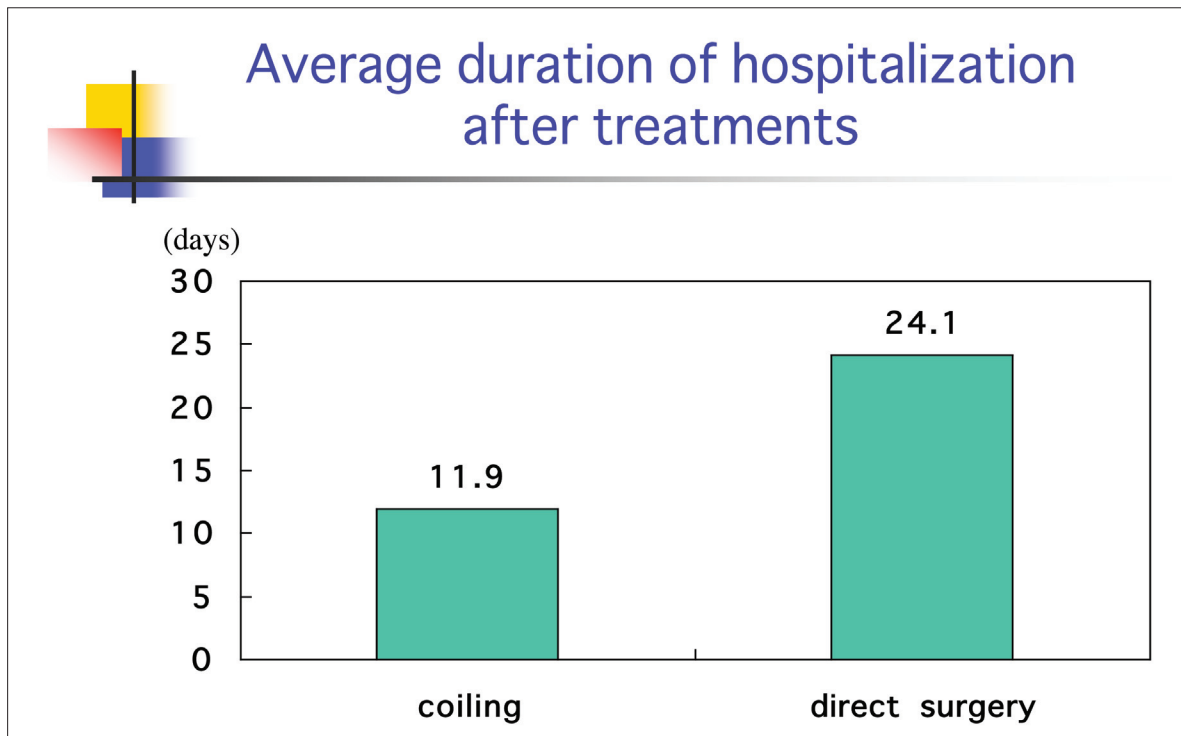


Figure 4 Average duration of hospitalization after the coil embolization or neck clipping.

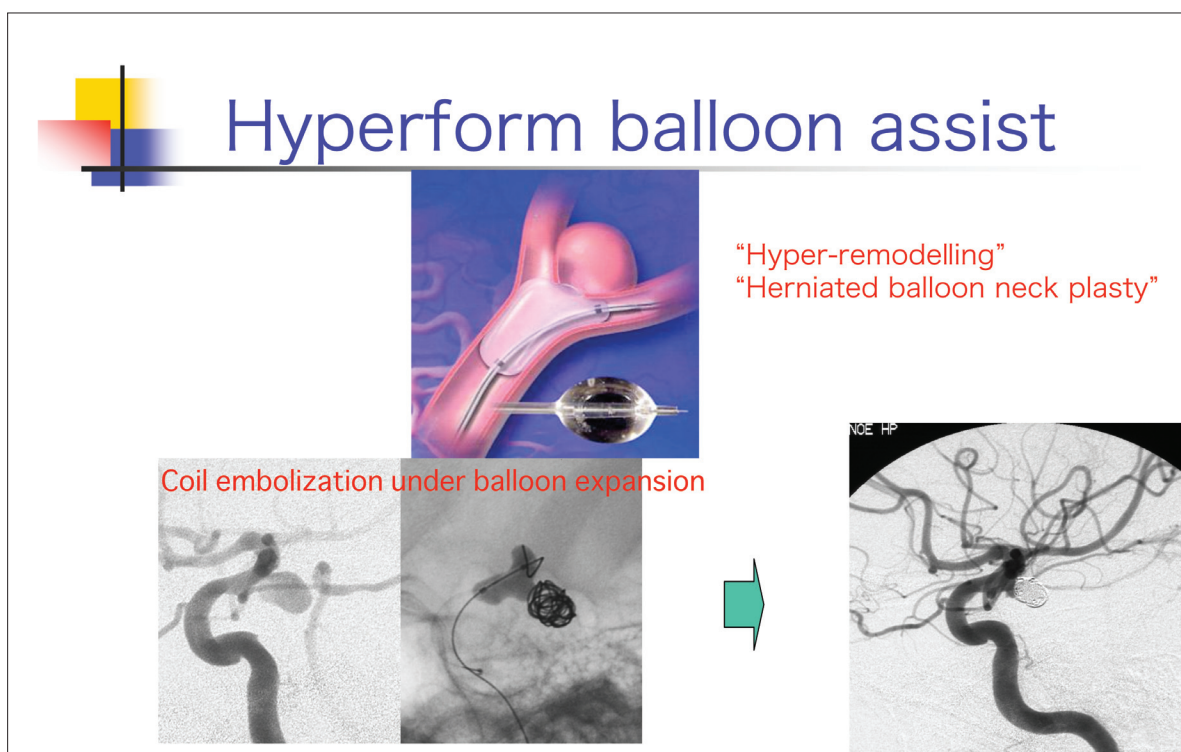


Figure 5 Coil embolization under balloon assist with Hyperform balloon.

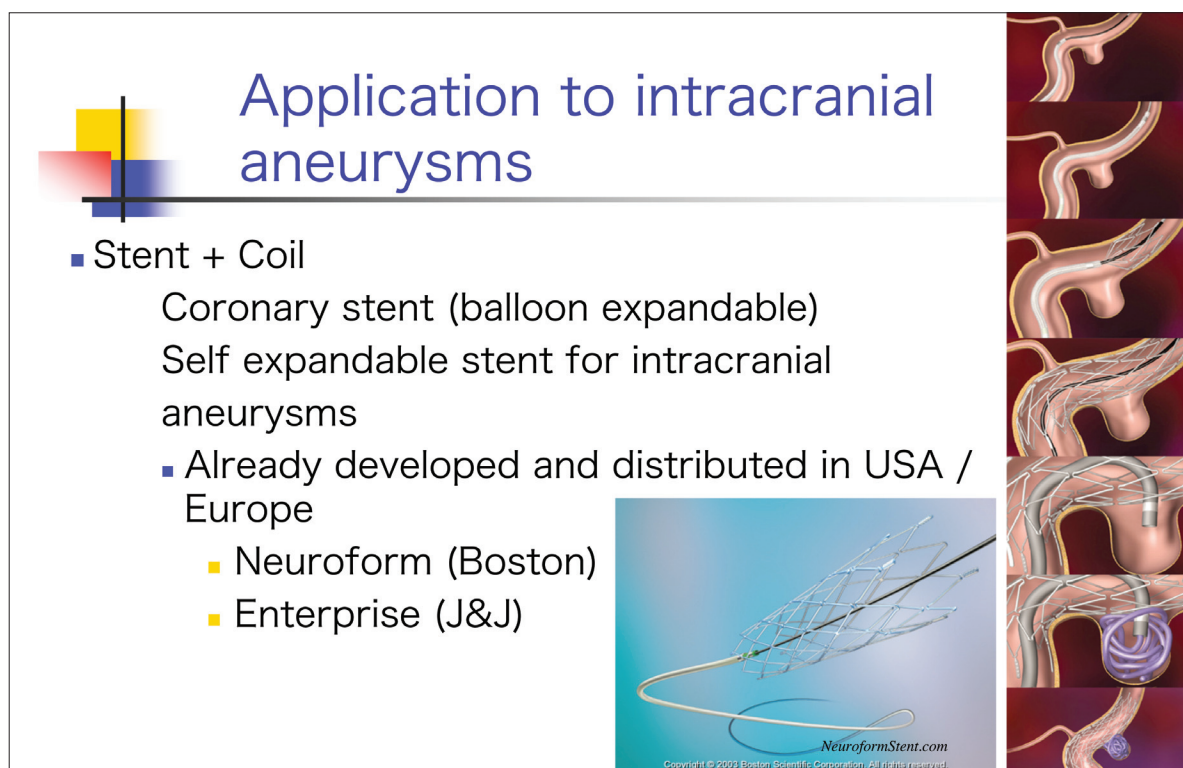


Figure 6 Coil embolization supported by Neuroform or coronary stent.

fection, two cases of epidural hematoma, one abducens nerve palsy, one hydrocephalus, one acute myocardial infarction among 78 neck clipping cases, and two subcutaneous hematoma, and one pseudoaneurysm at puncture points, one direct carotid-cavernous fistula in a total of 54 coiling cases. Four coil-treated cases, in which introduction of microcatheters to the aneurysm was impossible, were treated completely by neck clipping after endovascular treatments.

Figure 3 shows the modified Rankin Scale (mRS) three months after the treatments, while mRS 3 was noted only one case in the endovascular treatment group, there were one case of mRS 3, two cases of mRS 4, and two cases of mRS 5 in the neck clipping group.

Duration of hospitalization averaged 11.9 days in the endovascular group and 24.1 days in the neck clipping group (figure 4). In cases of endovascular treatments, we usually perform angiograms six months after treatment, and there were no cases that needed re-treatment because of coil compaction and no rupture cases after treatment.

Discussion

The report of the International Subarachnoid Aneurysm Trial (ISAT) study showed that coil embolization was superior to neck clipping as a treatment for subarachnoid hemorrhage (SAH)¹. Recently, some results of treatments for unruptured aneurysm via coil embolization and neck clipping have been reported^{2,3}. In our cases, generally better outcomes were obtained by endovascular surgery than by neck clipping. However four coiling cases in which introduction of microcatheters to the aneurysms were impossible to treat completely by neck clipping after endovascular treatments.

At present, we think that not all cases of unruptured aneurysms can be treated by endovascular treatment because of the shape of the aneurysm or lack of a safe access route to the aneurysm. When planning treatment of unruptured aneurysm, we should select the optimal treatment modality to avoid any complications. In our early cases, aneurysms of the anterior circulation were treated mainly by neck clipping because of accessibility via direct surgery,

and for posterior circulation and paraclinoid aneurysm, endovascular treatments were selected because of difficulties of approach by direct surgery. Since ISAT report, we have selected endovascular treatment when it appears possible to treat cases by either direct surgery or endovascular treatment and the relation between modality of treatment and location of aneurysm does not change. If the range of indication for treatment via coil embolization becomes wider, the overall outcome of aneurysm treatment is expected to improve because the results of coil embolization are better than those of clipping as neck clipping techniques have not progressed over years. To widen the range of indications for coil embolization, some new devices have recently been developed. For example, Hyperform balloon prevents coil deviation at the time of embolization by expansion of a flexible balloon (figure 5), and Neuroform, which is not yet available in Japan, and

coronary stent will prevent the coil deviation by deployment in the parent artery covering the neck area (figure 6).

Many new devices are expected to be developed to widen the range of indications for endovascular surgeries.

Conclusions

1) Generally, the outcomes of endovascular treatment for unruptured aneurysm are more favorable than those of direct surgery.

2) Width of the aneurysmal neck and relation of the aneurysm to the parent arteries affect the difficulties of treatment and may occasionally be contraindications. Therefore, surgeons should also be able to perform neck clipping as an alternative modality.

3) Many new devices are expected to be developed to widen the range of indications for endovascular surgeries.

References

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